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AUTHOR Malone, Mark R.
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ABSTRACT

Project MAFEX (Meta-Analysis of Field Experience) used standard meta-analysis techniques to synthesize the available body of research concerning preservice field experience programs. Several important questions were considered: (1) What types of field experience programs are most and least effective? (2) Are there common characteristics of field based programs that affect students consistently in all areas? and (3) How do field experiences in methods courses compare to field experiences in other areas of study? These programs were assessed in relation to preservice teacher attitudes, achievement, delayed outcomes, and teaching behavior. Consistent findings indicate that field experiences are generally positive experiences in general education courses, methods courses, and science methods courses. Attitudes, achievement, and teacher behavior, however, are not affected equally in all courses. In addition, duration studies of field experience indicate that few to moderate numbers of field experiences tend to have positive effects on preservice teachers. Conversely, exposure of students to many field experiences appears to dramatically diminish previous gains on desired outcomes. Eleven tables and a four-page bibliography are appended. (Author/JMK)

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Project MAFEX: Report on Preservice Field Experiences in Science Education*

Mark R. Malone
223C Peabody Hall
Department of Curriculum and Instruction
Louisiana State University
Baton Rouge, LA 70803

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Abstract

This paper presents the results of Project MAFEX (Meta-Analysis of Field Experience). The project utilized standard meta-analysis techniques to synthesize the available body of research concerning preservice field experience programs. Several important questions were considered: What type of field experience programs are most and least effective? Are there common characteristics of field based programs affect students consistently in all areas? How do field experiences in methods courses compare to field experience in other areas of study? These programs are assessed in relation to preservice teacher attitudes, achievement, delayed outcomes, and teaching behavior.

Consistent findings indicate that field experiences are generally positive experiences in general education courses, methods courses, and science methods courses. Attitudes, achievement, and teacher behavior, however, are not affected equally in all courses. In addition duration studies of field experience indicate that few to moderate numbers of field experience tend to have positive effectives on perservice teachers. Conversely, exposure of students to many field experiences appears to dramatically diminish previous gains on desired outcomes. Other field experience factors studies include: grade level, socio-economic status, disadvantaged schools, timing, study quality and others.

Project MAFEX: Report on Preservice
Field Experiences in Science Education

Objectives

Project MAFEX (Meta-Analysis of Field Experiences) was a research study funded by a grant from Louisiana State University. Its purpose was to synthesize the results of all research related to teacher education field experience programs. Over the past ten to fifteen years many college and university teacher education programs initiated procedures to give prospective teachers an opportunity to observe or participate in experiences with precollege students. This type of field experience program is designed to expose perservice teachers to the working of the public or private schools as early as possible during their college experience, either to facilitate a career choice or develop skills and attitudes useful to future teaching. These experiences range from simple classroom observations to actual small and large group instruction. Field experiences are done prior to and in addition to the preservice teachers' student teaching experience. The purpose of this investigation was to determine ways in which these types of programs have and have not been effective. The effectiveness of field experiences in science and other methods courses was compared and contrasted to field experiences in other content areas.

Methods

The field experience concept was studied by standard meta-analysis techniques developed by Glass et al., 1981. Research integration through this process differs greatly from simple literature reviews conducted in recent years. Typical reviews of literature attempt to summarize the results of studies by categorizing them as having either significant or non-significant

results and then counting the number of significant studies either favoring or refuting a concept. Studies which do not reach "statistical significance" are generally ignored and often make up the bulk of studies summarized. By contrast, meta-analysis attempts to locate and include all relevant studies conducted in a particualr field regardless of "statistical significance". Original statistics from all studies are recalculated and transformed to a common metric. The new metric utilized to report the results of this study is the "effect size" measure signified by a "Δ" (delta). The effect size is a measure of standard deviation similar to a common "z - score". If two programs (eg. field experiences vs. non-field experience teacher education programs) are compared, results are reported in terms of an effect size. As a matter of convention, the first group listed in a comparision is the superior group with a positive effect size or the inferior group with a negative effect size. For example, a + 0.5 indicates that the field experience program yields results on some measure that is half a standard deviation higher than a non-field experience group. The advantage of the effect size measure is that it is able to indicate not only the direction of the effect of a program but also the degree of effectiveness of a given field experience program.

Data Source

Data included in this study were gathered from various sources searched both manually and by computer. These included journal articles, dissertations, fugitive documents, and supplemental informaiton about studies gathered directly from the original researchers. Research studies on field experience programs were located as early as 1960 through 1983. The largest number of studies were conducted in the late 1970's. Every attempt was made to locate all relevant studies conducted in the area. Thousands of document titles were scanned by

computer and hand searched from several data bases. Over 750 document abstracts and 250 actual articles were read. In addition, the bibliographies of all studies were searched for new studies. As a result 45 of these articles described relevant research studies and contained enough statistical data to calculate usable effect sizes. One hundred forty-seven effects were calculated from these studies. Dates for studies coded are reported in Table I.

Outcome Measures

Many types of outcome measures have been used over the last 20 years to measure the effectiveness of field experience programs. This study reduced these measures to five catagories: attitudes, achievement, teaching behaviors, delayed outcomes and combined outcomes

Attitudes - Various measures of preservice teacher concerns, perceptions and attitude make up this category. Instruments comprising these measures included standardized attitude instruments, measures developed by researchers, surveys and preservice teacher-self assessments. Table II indicates specific attitudes included and coded. The effects of field experiences in each area are also described.

Achievement - Achievement measures includ the results of standardized and on-site developed measures of concepts related to the content of the course in which the field experience took place.

Teaching Behavior - This area included various types of evaluations of how well preservice teachers taught. These were measured by trained raters, supervisor ratings, cooperative teacher ratings and in a few cases self assessment by preservice teachers.

Delayed Outcomes - These included a variety of measures concerning preservice teacher later employment, professional satisfaction, teaching performance, & attitudes which were measured well after the

end of the field experience. All data in these catagories was collected either during student teaching or from inservice teachers.

Combined Outcomes - All four of the above outcomes are combined to produce this category. Collasping other outcome measures allows breakdowns of interest that would not be possible otherwise. These should be viewed as a general assessment of the effectiveness of field experiences.

RESULTS

COMPARING FIELD EXPERIENCE AND NON-FIELD EXPERIENCE COURSES

In all data included in this section, students receiving field experience in various settings and conditions are compared to students receiving no field experience. The results of this study indicate that field experience in teacher training programs are generally positive experiences for preservice teachers (PSTs). However, the results show that in many cases field experiences are more productive in some courses than in others. Table IV shows comparisons of how well field experiences work with various outcome measures in several types of courses. The overall effects of a field experience course is quite small (Δ = .12), however field experience placed in general education courses appear to have the strongest effect (Δ = .53). Field experiences placed in science and other methods courses tend to have their largest effect in improving teaching behaviors (Δ = .36) and in acieving long range benefits (Δ = .20).

Also considered was the setting in which the field experience took place. All studies were coded, if possible, to indicate if schools where the field experience took place were either high, medium, low or mixed socio-economic status (SES) or disadvantaged school. There is a slight overlap between schools included in these categories. Table V shows that field experiences taking place in low SES schools and disadvanged schools have the most positive effects on

attitudes (Δ = .28, Δ = .24) delayed outcomes (Δ = .23, Δ = .24) and combined measures (Δ = .25, Δ = .24).

The setting in which field experience take place was also analyzed according to the grade levels of cooperating schools. Settings included elementary schools high schools and mixed grade levels. Attempts were made to code for preschools, middle schools and junior high schools but insufficient studies were conducted in these areas. Results from Table VI indicate generally that field experiences are somewhat more effective in high school and mixed settings than in elementary schools. However, the results are somewhat contradictory on various outcome measures.

The academic level of the student was also considered as a condition of field experience placement. Table VII indicates that field experiences tend to be most effective when conducted with freshman and sophmore level students (Δ = . 70). The results across various outcome measures are somewhat inconclusive due the paucity of research conducted in this area.

NUMBER OF FIELD EXPERIENCES

For purposes of statistical analysis the numbers of field experience classes were reduced to categorical variables. The following conventions were used: few = 1 course (or less) with related field experience (FEX), moderate = 2 FEX courses, many = 3 or more FEX courses. The category of "many" field experiences ranged from 3 to 8 courses with an associated field experience with a mean of 4.6 courses and a standard deviation of 1.0. Results indicate that PSTs who received moderate amounts of field experience exhibit more positive attitudes, superior student teaching behaviors and better achievement than PSTs receiving few field experiences (See Table VIII). This benefit is effectively reversed when the amount of field experience is increased. Students participating in many field experiences have less positive attitudes, inferier student teaching behaviors and poorers achievements than those participating in

a moderate amount of field experience. This tends to indicate that exposure to field experiences reaches a point of diminishing returns. The accuracy of this phenomenon is reinforced when students receiving many field experiences are compared to those receiving few. This finding is consistent for all outcome measures involving duration.

FIELD EXPERIENCES AND SUBJECT AREAS

Field experiences have been utilized in many types of teacher education programs. Table X indicates how various subject areas compare when field experience PST's and non-field experience PST's are studied. The only clearcut trend from this data is that general education course field experiences tend to be more effective than those in methods courses. Most of the study in this area has been in mixed methods courses (blocked courses involving more than on subject area) (n = 29) and science methods courses (n = 13)

Table XI includes not just field experience to non-field experience comparisons but the results of all types of studies conducted with field experience. This table is included only to show the breadth of studies coded for this project.

STUDY QUALITY

The quality of studies coded for this research project are examined in Table IX. Fifteen study characteristics delineated indicate that low quality studies included in the analysis have likely contributed to somewhat conservative results in all areas of analysis. The problem areas include: low overall quality, poor external validity, studies coded from gains scored, and others. When these studies are eliminated in subsequent analysis, the results in several areas of interest will likely increase. The measure of overall quality indicates that 82% of all studies included were of high or average quality.

Conclusion

This study has summarized the results of all available field experience studies conducted from 1960 to 1982. Results indicate that general education courses tend to develop PST attitudes and achievement while methods courses best develop PST teaching behaviors and long range skills and attitudes. Future studies will benefit if they consider outcome measures consistent with the strength of the various types of field experiences.

Contrary to what might have been expected, field experiences in low socio-economic status schools and disadvantaged schools seem to elicit the most positive PST attitudes, best achievement and strongest long term outcomes. It is suggested that PSTs in these depressed environments may perceive themselves as being better able to make a contribution and have an effect on students. In the past low SES and disadvantaged schools have often been excluded from field experiences in the belief that field experiences in those locations would have negative effects.

Generally field experiences seem to be more effective with freshman and sophomore level PSTs than junior and senior level PSTs. Efforts should be made to expose PSTs to field experiences as early as possible for maximum effect. However, caution should also be taken not to over expose PSTs to field experiences. Students receiving 3 or more preservice field experiences may actually regress on various measures after having reach the point of diminishing returns with the experience.

Project MAFEX has investigated field experience studies conducted in various subject areas. Science methods courses compare favorably with other methods courses in the effectiveness of their field experiences. Science and other methods courses are generally most effective in improving preservice teachers' teaching behaviors and long term characteristics. General education courses tend to affect shorter term attitudes and course achievement. These

results have implications for future field experience research. Research on general education and introductory education courses should benefit by concentrating on attitutes and achievement outcomes. Science and other methods field experience research will benefit from including outcome measures related to teaching behaviors and long range teacher characteristics.

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Table I

Year of Studies

Year		n	Year		n	Year		n
1960	=	1	1973	=	3	1979	=	5
1965	=	1	1974	=	3	1980	=	4
1968	=	1	1975	=	3	1981	=	6
1970	=	1	1976	=	2	1982	=	1
1971	=	1	1977	=	4			
1972	=	1	1978	=	4			

Table II

Comparison of Field Experience to Non-Field Experience Groups on Attitudes

Breakdowns	Δ*	Sd**	n***	min. Δ	max. Δ
overall effects	.13	.41	30	-.69	1.60
general attitudes	.29	.25	5	-.01	.67
self concept	-.28	.41	3	-.69	.13
teacher concerns	-.02		1		
self perceptions	-.17	.59	2	-.59	.24
attitudes toward teaching (general)	.30	.51	10	-.15	1.60
attitudes toward content	.12	.32	3	-.21	.43
attitudes toward teaching content	-.01	.15	5	-.26	.16
attitudes toward children	.30		1		

* (Δ+ or Δ -) = direction for first group
** Sd = standard deviation of effects
***n = number of effects

Table III

Comparison of Field Experience to Non-Field Experience Groups on Delayed Outcomes

Breakdowns	Δ*	Sd**	n***	min. Δ	max. Δ
overall effects	.17	.28	19	-.33	.82
later employment	.39		1		
profession satisfaction	-.18		1		
desire to continue teaching	.04		1		
student teaching performance	.04		1		
general attitudes	.14	.43	5	-.33	.82
teaching behavior	.18	.31	4	-.03	.64
attitude toward preparation	.28	.25	2	.10	.46
attitude toward teaching	.22	.03	3	.20	.26
other	.37		1		

* (Δ+ or Δ-) = direction for first group listed
** Sd = standard deviation of effects
***n = number of effects

Table IV

Comparison of Field Experience to Non-Field Experience Groups on Various Outcomes and Course Types

Category/Breakdowns	Δ*	sd**	n***	min. Δ	max. Δ
COMBINED OUTCOMES					
overall effects	.12	.40	67	-1.06	1.60
general education	.28	.28	15	-.18	1.60
methods courses	.07	.44	49	-1.06	.97
science methods	.07	.33	13	-.33	.97
ATTITUDES					
overall effects	.13	.41	30	-.69	1.60
general education	.32	.66	6	-.15	1.60
methods courses	.12	.39	24	-.69	.67
science methods	-.06	.17	5	-.29	.16
ACHIEVEMENT					
overall effects	.03	.47	12	-1.06	.57
general education	.53	.04	3	.50	.57
methods courses	-.02	.42	9	-1.06	.32
science methods	.12	.15	5	-.07	.32
TEACHING BEHAVIOR					
overall effects	.11	.57	10	-.68	.97
general education	.06	.41	6	.68	.64
methods courses	.36	.43	4	.02	.97
science methods	.97	—	1	—	—
DELAYED OUTCOMES					
overall effects	.17	.28	19	-.33	.82
general education	.10	.19	6	-.18	.39
methods courses	.20	.30	13	-.10	.82
science methods	-.16	.25	2	-.33	.02

* (Δ+ or Δ-) = direction for first group listed
** sd= standard deviation
*** n= number of effects

Table V

Comparison of Field Experience to Non-Field Experience Group on Various Outcomes in Varied School Settings

Category/Breakdowns	Δ*	sd**	n***	min. Δ	max. Δ
COMBINED OUTCOMES					
low SES	.25	.29	12	-.29	.64
mixed SES	.13	.17	6	-.10	.36
average SES	.05	.44	46	-1.00	1.60
disadvantaged	.24	.26	15	-.29	.64
not disadvantaged	.08	.43	52	-1.06	1.60
ATTITUDES					
low SES	.28	.33	5	-.29	.52
mixed SES	.03	.06	2	.01	.07
average SES	.11	.44	23	-.69	1.60
disadvantaged	.24	.30	6	-.29	.52
not disadvantaged	.10	.10	24	-.69	1.60
ACHIEVEMENT (insufficient data)					
TEACHING BEHAVIOR (insufficient data)					
DELAYED OUTCOMES					
low SES	.23	.27	7	-.10	.64
mixed SES	.23	.04	2	.20	.26
average SES	.12	.31	10	-.33	.82
disadvantaged	.23	.25	8	-.10	.64
not disadvantaged	.13	.30	11	-.33	.82

* (Δ+ or Δ-) = direction for first group listed
** sd = standard deviation of effects
*** n = number of studies

Table VI

Comparison of Field Experience to Non-Field Experience Groups on Various Outcomes in Various Educational Levels

Category/Breakdown	Δ*	sd**	n***	min. Δ	max. Δ
COMBINED MEASURES					
elementary	.01	.37	34	-1.06	.97
high school	.16	.47	11	-.68	.82
mixed	.27	.37	21	-.18	1.60
other	-.03	—	1	—	—
ATTITUDES					
elementary	.03	.36	16	-.69	.67
high school	.00	.40	4	-.59	.24
mixed	.43	.47	9	-.01	1.60
other	-.03	—	1	—	—
ACHIEVEMENT					
elementary	—	—	0	—	—
high school	.06	.57	8	-1.06	.57
mixed	-.04	.17	4	-.23	.16
TEACHING BEHAVIOR (insufficient data)					
DELAYED OUTCOMES					
elementary	.06	.25	6	-.33	.37
high school	.43	.55	2	.04	.82
mixed	.18	.23	11	-.18	.64

* (Δ+ or Δ-) = direction for first group listed
** sd = standard deviation
*** n = number of effects

Table VII

Comparison of Field Experiences to Non-Field Experience Groups on Various Outcomes for Various Preservice Teacher Levels

Category/Breakdown	Δ*	sd**	n***	min. Δ	max. Δ
COMBINED OUTCOMES					
freshman/sophomore	.70	.61	4	.26	1.60
junior/senior	.14	.34	44	-1.06	.97
mixed	-.06	.36	19	-.69	.64
ATTITUDES					
freshman/sophomore	.70	.61	4	.26	1.60
junior/senior	.13	.24	19	-.29	.67
mixed	-.21	.33	7	-.69	.22
ACHIEVEMENT					
freshman/sophomore	—	—	0	—	—
junior/senior	.06	.57	8	-1.06	.57
mixed	-.04	.17	4	-.23	.16
TEACHING BEHAVIOR (insufficient data)					
DELAYED OUTCOMES					
freshman/sophomore	—	—	0	—	—
junior/senior	.13	.27	14	-.33	.82
mixed	.30	.26	5	-.03	.64

* (Δ+ or Δ-) = direction for first group listed
** sd = standard deviation of effects
*** n = number of effects

Table VIII

Comparison of Numbers of Field Experience Courses on Preservice Teachers

Catagory/Duration	Δ*	Sd**	n***	min. Δ	max. Δ
ATTITUDES					
moderate/few	.13	.51	7	-.53	.78
many/moderate	-.29	.37	13	-.95	.28
many/few	.13	.38	9	-.37	.64
STUDENT TEACHING PER.					
moderate/few	.71	.40	3	.43	1.17
many/moderate	-.35	.05	2	-.38	-.31
many/few	.10	.47	13	-.54	.24
COMBINED OUTCOMES					
moderate/few	.31	.52	12	-.53	1.17
many/moderate	-.31	.33	13	-.95	.28
many/few	.07	.48	23	-.54	1.24

*(Δ+ or Δ-) = direction for first item in each contrast pair
** Sd = standard deviation of effects
***n = number of effects

Table IX
Quality of Research Studies Coded

overall quality		(n)	comparability		(n)	instrumentation		(n)
high	.18	(24)	high	.26	(24)	good	.14	(77)
medium	.10	(96)	medium	.11	(78)	average	.06	(61)
low	.03	(27)	low	-.01	(45)	poor	.01	(9)

form of study		(n)	test reliability		(n)	statistics		(n)
journal	.20	(39)	low	.25	(2)	good	.10	(83)
dissertation	.01	(83)	medium	.20	(8)	average	.10	(46)
unpublished	.22	(23)	high	.09	(90)	poor	.08	(18)
blank	.32	(2)	not sure	.08	(46)			

comparability		(n)	sampling		(n)	conclusions		(n)
good	.08	(58)	good	.12	(29)	good	.10	(102)
average	.09	(73)	average	.06	(61)	average	.09	(8)
poor	.19	(16)	poor	.14	(57)	poor	.08	(37)

design		(n)	internal		(n)	external		(n)
good	.20	(42)	good	.23	(32)	good	.10	(93)
average	.07	(87)	average	.14	(60)	average	.18	(41)
poor	-.02	(18)	poor	-.02	(55)	poor	-.22	(13)

sample selection		(n)	assign. to group		(n)	source		(n)
available	.11	(95)	intact	.11	(89)	means & var.	.08	(78)
volunteers	.13	(15)	random	.13	(41)	t or F test	.16	(42)
random	.09	(21)	matched	.15	(6)	non-para.	.51	(2)
systematic	.14	(2)	covariance	-.14	(11)	gains	-.15	(7)
clustered	-.03	(1)				p values	.98	(2)
judgmental	.36	(1)				ANCOVA	.06	(14)
combination	-.01	(12)				correlations	-.52	(2)

Table X

Comparison of Field Experience to Non-Field Experience Groups on Combined Outcomes of Subject Areas

Breakdowns	Δ*	sd**	n***	min. Δ	max. Δ
overall effects	.12	.40	67	-1.06	1.60
science	.07	.33	13	-.33	.97
mathematics	-.29	.67	3	-1.06	.15
social science	-.49	—	1	—	—
reading	.36	—	1	—	—
special education	—	—	0	—	—
vocational education	—	—	0	—	—
early childhood	—	—	0	—	—
music	-.07	.23	2	-.23	.09
general education	.28	.44	15	-.18	1.60
mixed methods	.13	.38	29	-.69	.82
other	.05	.19	3	-.10	.26

* (Δ+ or Δ-) = direction for first group listed
** sd = standard deviation of effects
*** n = number of effects

Table XI

Breakdowns for All Studies with Combined Outcomes

Breakdowns	Δ*	Sd**	n***	min. Δ	max. Δ
overall effects	.10	.44	147	-1.06	1.60
science	.21	.41	20	-.33	1.45
mathematics	-.10	.46	7	-1.06	.22
social studies	.29	.69	5	-.46	1.17
reading	.36		1		
special education	-.61	.33	5	-.95	-.13
vocational education	.18		1		
early childhood	.09		1		
music education	-.07	.16	3	-.23	.09
education (general)	.13	.44	26	-.77	1.60
mixed methods	.09	.38	69	-.69	.82
other	.30	.58	9	-.35	1.24

* (Δ+ or Δ-) = direction for first group listed
** Sd = standard deviation of effects
*** n = number of effects-

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